PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	19.10.2005

Applicant's or agent's file reference	IMPORTANT NOTIFICATION
K2365-PCT 26	

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/BE2004/000121	25.08.2004	26.08.2003

Applicant
K.U. LEUVEN RESEARCH & DEVELOPMENT et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference K2365-PCT	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/BE2004/000121	International filing date *(day/month/year)* 25.08.2004	Priority date *(day/month/year)* 26.08.2003
International Patent Classification (IPC) or national classification and IPC A61K9/14		
Applicant K.U. LEUVEN RESEARCH & DEVELOPMENT et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 4 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☒	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand 24.06.2005	Date of completion of this report 19.10.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Veronese, A Telephone No. +49 89 2399-7824

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/BE2004/000121

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-28	as originally filed
Claims, Numbers	
1-32	received on 24.06.2005 with letter of 24.06.2005
Drawings, Sheets	
1/8-8/8	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-31
	No:	Claims	32
Inventive step (IS)	Yes:	Claims	20,21
	No:	Claims	1-19,22-31
Industrial applicability (IA)	Yes:	Claims	1-32
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

Re Item V.

The following document have been cited in the search report. Where reference is made to them, the following numbering is used; unless otherwise indicated, reference is made to the relevant passages indicated in the Search Report:

D1 : DATABASE WPI Section Ei, Week 197930 Derwent Publications Ltd., London, GB; Class S02, AN 1979-G4608B XP002311257 &; SU 627 334 A (FERMENT PRODUCT RES) 21 August 1978.

D2 : US 4 676 439 A (HIRAI AKIRA ET AL) 30 June 1987 (1987-06-30)

D3 : PATENT ABSTRACTS OF JAPAN vol. 2002, no. 04, 4 August 2002 (2002-08-04) &; JP 2001 348581 A (SAWADA SHIGEMI; KOMATSU LTD), 18 December 2001 (2001-12-18)

D4 : DATABASE CA [Online] CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; KUZNETSOV, YU. N. ET AL: "Electromagnetic grinding .of .materials" XP002311255 retrieved from STN Database accession no. 1977:75083.

D5 : DATABASE CA [Online] CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; 1987, SVALOV, S. A. ET AL: "Use of the magneto - induction effect for intensification of grinding" XP002311256 retrieved from STN Database accession no. 1987:481485.

1. Amendments

The applicant has amended claim1 introducing the limitation that the particles are suspended in a liquid, and specifying the linear flow rate through the magnetic field.

2. Novelty (Art.33(2) PCT)

2.1 Claims 1-31

D1 discloses a method for milling powders (of a drug or a food), where the powder is suspended in a magnetic field in the presence of magnetic balls which are transferred in the chaotic state by an altemating magnetic field. A 25% size reduction of the powders is to be expected. D1 however does not mention that the powder is suspended in a liquid (it seems that the process is carried out in air).
For this reason, the subject matter of claims 1 and 26, and of the respective dependent claims is new over D1.

2.2 Claim 32

Despite its wording, claim 32 is a product by process claim directed to a population of biologically active compounds "obtainable" by the process of claims 1 and 27. Since the milling method of the invention does not appear to produce a product characterised by particular technical features, this claim is not novel over any prior art composition comprising particles of an active agent having particle size of 0.45 - 5 micrometers.

3. Inventive step (Art.33(3) PCT)

The problem underlying the present invention is the provision of a process to reduce the dimension of particles (and agglomerates) of biologically active agents.

D3 discloses an apparatus and a process for micronizing liquid micelle particles. The process includes the linear flow of a liquid where the particles are suspended through a strong magnetic field. The applicant's attention is drawn to the figures accompanying the abstract of **D3**.
D3 does not mention the particle flow rate, and the percentage of size reduction. However, it appears that a size reduction of 25% will be obtained with this method, and that the claimed flow rate is what a skilled person would use when using a similar process.
Since claim 1 is not limited to the treatment of solid particles, and also covers liquid particles like the ones disclosed in **D3**, at least a part of the claimed subject matter is obvious. In fact, a skilled person confronted with the underlying technical problem, would use the apparatus and the process disclosed in **D3** as proposed in the present application.
For this reason claim 1, and all dependent claims which are not clearly directed to the treatment of solid particles are not considered to involve an inventive step.
Claims 20 and 21 are considered to involve an inventive step.

D2, **D4-D5** disclose a milling process to decrease the particle size of powders, where the particles are suspended in a fluid (air), in a magnet field. The teaching of these documents appears to be limited to a classical milling process where the powder is

suspended in air. Nothing in these documents would prompt a skilled person to carry out the same process in a liquid. For this reason claims 1-31 involve an inventive step over these documents.

4. Industrial Application

The subject matter of claims 1-33 is industrially applicable.

Re Item VI.

WO03072659 and WO2004043580, published after the priority date, but before the filing date, could become relevant in the proceedings before the national authorities of the designated states.
In particular, WO030272659 appears to prejudice the novelty of the claimed subject matter, and also the novelty of claims restricted to the treatment of solid particles.

CLAIMS

1. A method for reducing the average size of biologically active compound particles or agglomerates suspended in a liquid by flowing one or more times said liquid having biologically active compound particles or agglomerates suspended therein through one or more magnetic fields to reduce the average size of a substantial portion of the biologically active compound particles or agglomerates by at least 25%, wherein the linear flow rate of said liquid through each said magnetic field is between 0.25 and 25 m/s.

2. A method according to claim 1, wherein the strength of each said magnetic field is at least about 2,000 gauss.

3. A method according to claim 1 or claim 2, wherein the average size of said biologically active compound agglomerates before performing said method is in a range from about 10 µm to about 100 µm.

4. A method according to any of claims 1 to 3, wherein the average size of a substantial portion of said biologically active compound agglomerates after performing said method is reduced to a range from about 0.45 µm to 5 µm.

5. A method according to any of claims 1 to 4, wherein said substantial portion is at least 50% by weight of the suspended agglomerates.

6. A method according to any of claims 1 to 5, wherein the average particle size of said biologically active compound particles before performing said method is in a range from about 0.5 µm to about 10 µm.

7. A method according to any of claims 1 to 6, wherein the average particle size of said biologically active compound particles after performing is reduced to a range from about 0.5 nm to about 500 nm.

8. A method according to any of claims 1 to 7, wherein the average size of a substantial portion of the biologically active compound particles or agglomerates is reduced by at least 50%.

9. A method according to any of claims 1 to 8, wherein said liquid is water.

10. A method according to any of claims 1 to 8, wherein said liquid is an organic solvent or a combination thereof with water.

11. A method according to any of claims 1 to 10, wherein said biologically active compound particles or agglomerates are suspended in said liquid in the form of a slurry and the concentration of said biologically active compound particles or agglomerates in said liquid is at least two times the solubility limit of said biologically active compound in said liquid under the physical (temperature, pressure) and chemical (pH) conditions prevailing while flowing said slurry through said magnetic field.

12. A method according to any of claims 1 to 11, wherein flowing said liquid through said magnetic field is effected at a temperature between the freezing temperature and the boiling temperature of said fluid under the pressure prevailing while flowing said fluid through said magnetic field.

13. A method according to any of claims 1 to 12, wherein flowing said liquid through said one or more magnetic fields is effected at a temperature between about 2°C and 95°C under atmospheric pressure.

14. A method according to any of claims 1 to 7, wherein the average size of a substantial portion of the biologically active compound particles or agglomerates is reduced by at least 80%.

15. A method according to any of claims 1 to 14, wherein said liquid includes one or more stabilizing agents.

16. A method according to claim 15 wherein the stabilizing agent is a surfactant, a polymer, a silicate, a hydrophilic agent or a combination thereof.

17. A method according to claims 15 or 16, wherein said stabilizing agent comprises a surfactant in an amount such as to produce surfactant-capped nanoparticles.

18. A method according to any of claims 1 to 17, wherein said fluid is re-circulated two or more times through said one or more magnetic fields.

19. A method according to any of claims 1 to 18, wherein the residence time of said liquid through each said magnetic field is between 60 microseconds and 10 seconds.

20. A method according to any of claims 1 to 19, wherein the biologically active compound is in a crystalline form.

21. A method according to any of claims 1 to 19, wherein the biologically active compound is in an amorphous form.

22. A method according to any of claims 1 to 21, wherein the biologically active compound is a drug classifiable as Class II or Class IV of the Biopharmaceutical Classification System.

23. A method according to any of claims 1 to 22, wherein the biologically active compound is a drug having a water-solubility below about 2 mg/ml.

24. A method according to any of claims 1 to 23, wherein the biologically active compound is a drug having a water-solubility below about 5 µg/ml.

25. A method according to any of claims 1 to 24, wherein the biologically active compound is a cosmetic agent, a diagnostic agent, a herbicide, an insecticide, a biocide or a fungicide.

26. A process for manufacturing a biologically active compound formulation, the said process involving the use of biologically active

compound particles or agglomerates, comprising a step of reducing by at least 25% the average size of a substantial portion of said biologically active compound particles or agglomerates, wherein said step includes a method according to any of claims 1 to 25.

27. A process according to claim 26, wherein said process further comprises one or more post-processing steps performed following the size reducing step.

28. A process according to claim 26 or claim 27, wherein said post-processing step is a drying step for substantially removing the liquid in which the biologically active compound particles or agglomerates are suspended during the size reducing step.

29. A process according to claim 28, wherein said drying step comprises freeze drying.

30. A process according to claim 28, wherein said drying step comprises spray drying.

31. A process according to any of the claims 26 to 30, wherein said post-processing step is a step of mixing an adjuvant together with the optionally dried particles or agglomerates with reduced size.

32. A population of biologically active compound particles obtained by a method according to any of claims 1 to 25 or a process according to any of claims 26 to 31.

PN - JP2001348581 A 20011218

TI - APPARATUS AND METHOD FOR MICRONIZING LIQUID MOLECULAR CLUSTER

AB - PROBLEM TO BE SOLVED: To micronize a liquid molecular cluster, concretely, to produce a high-quality emulsion fuel at a low cost in large amount.

- SOLUTION: A liquid-stirring device 13 and a magnetic field-impressing device 15 are installed in a passage 100. The liquid-stirring device 13 has a plurality of rotors 17a, 17b and 17c, and a plurality of nozzles 19a, 19b and 19c alternatively installed in the interior. The magnetic field-impressing device 15 has N-pole magnets 24, 24... on one side surface and S-pole magnets 25, 25... on the side surface facing thereto. In the liquid-stirring device 13, the emulsion fuel collides with the rotors 17a, 17b and 17c at a high speed by being pressed out from a pump 23 or jetted from nozzles 19a and 19b so as to be crushed, and is comprehensively stirred by the rotation of the rotors 17a, 17b and 17c. When the emulsion fuel passes through the interior of the magnetic field-impressing device 15 from the liquid-stirring device 13, an electromotive force is generated in the vertical direction to the passage direction and the impression direction of the magnetic field, and each of the molecular clusters of a micelle particles is torn off by the electromotive force to promote the mixing and diffusion of the micelle particles and to reduce the particle diameters.

- C10L1/32

SI - B01J19/00

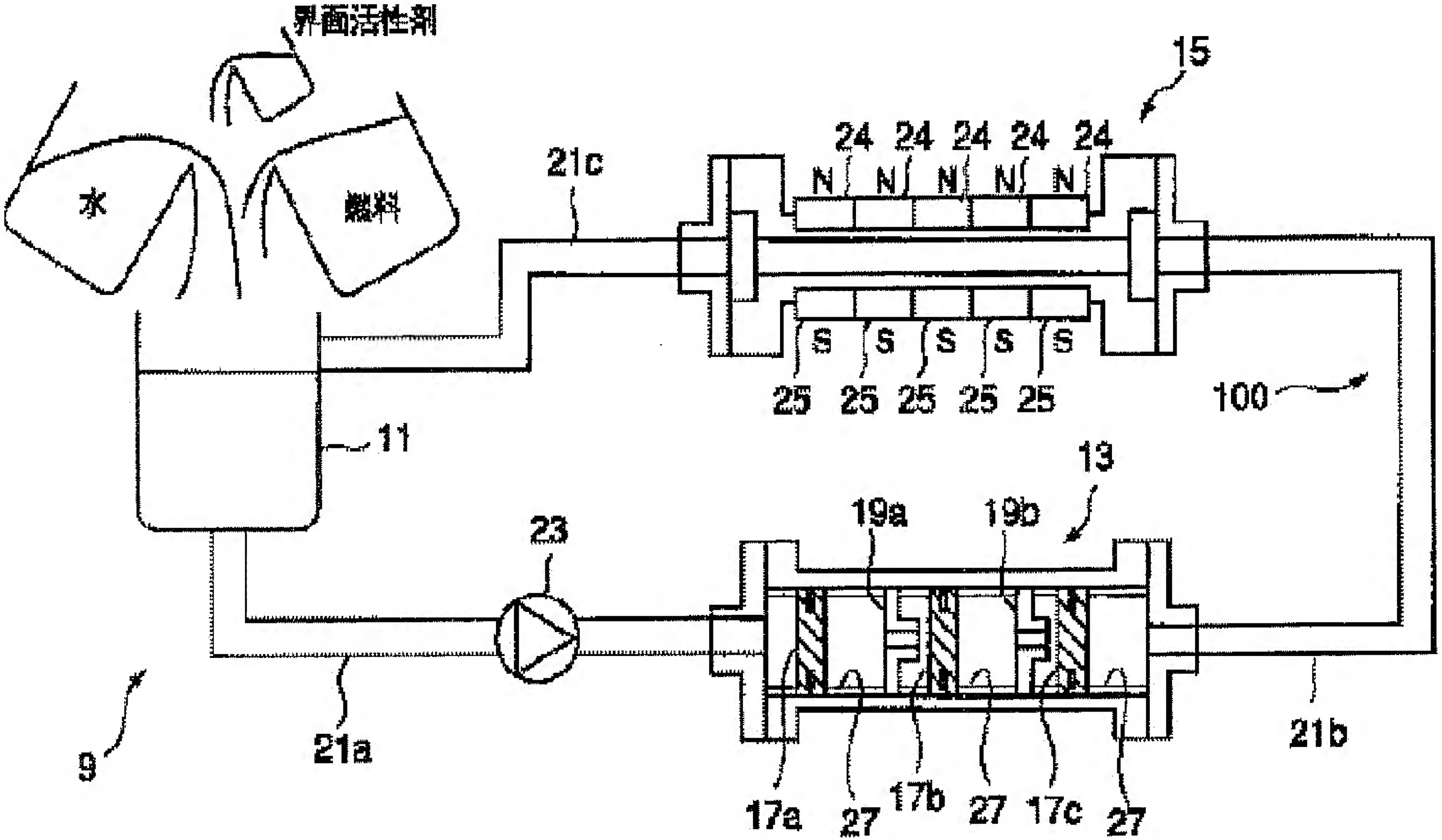
PA - SAWADA SHIGEMI; KOMATSU LTD

IN - SAWADA SHIGEMI; SAKURAGI SHUNICHI; KATO YUTAKA

ABD - 20020804

ABV - 200204

AP - JP20000171855 20000608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19a
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23
9
21a
21b
17a
27
17b
27
17c
27

の関係図。

【図９】液体撹拌装置１３及び磁場印加装置１５を、ディーゼルエンジンへの燃料供給システムに適用したときの構成を示す図。

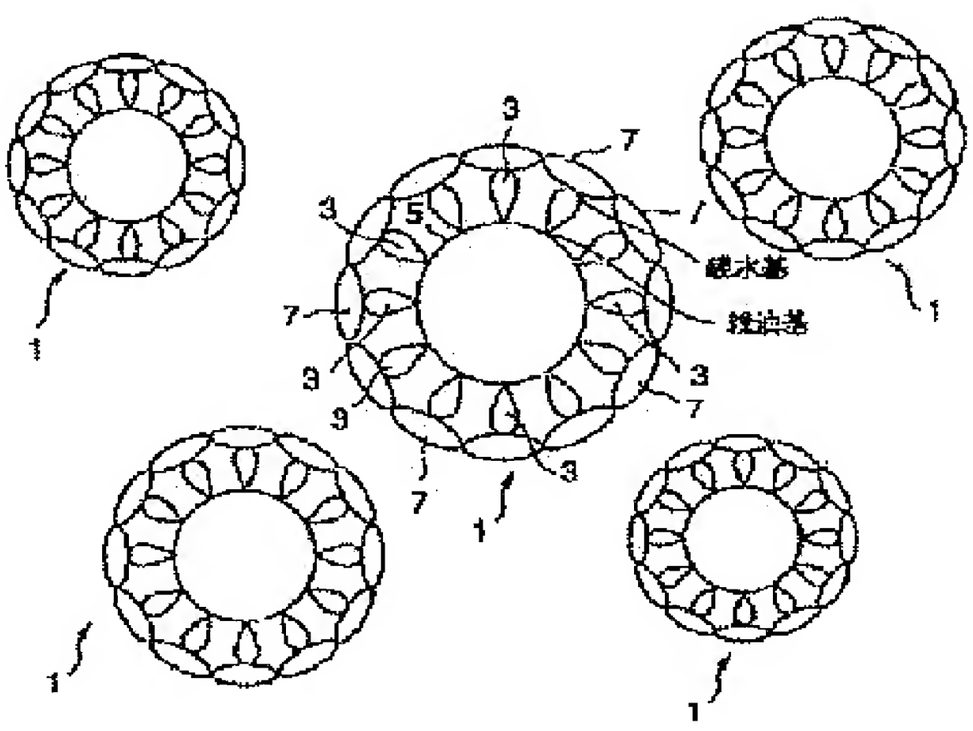
【図１０】破砕粒子充填装置の構成を示す図。

【図１１】超音波微粒化装置の構成を示す図。

【符号の説明】

１１　液体槽
１３　液体撹拌装置
１５　磁場印加装置
１７ａ、１７ｂ、１７ｃ　ロータ
１９ａ、１９ｂ　ノズル
２３　ポンプ

【図１】



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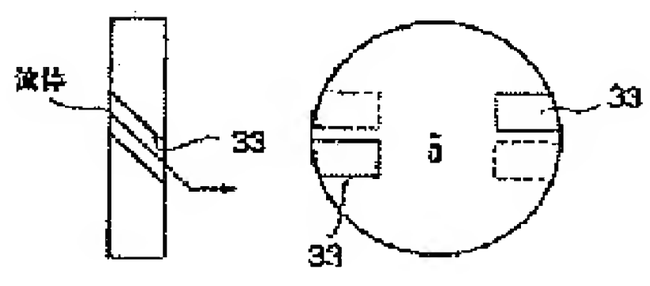

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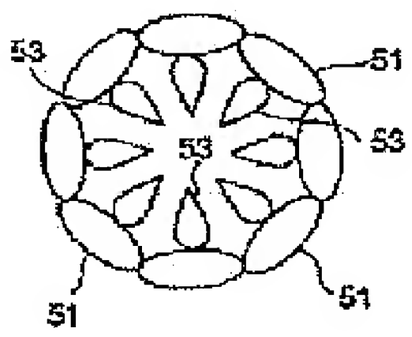
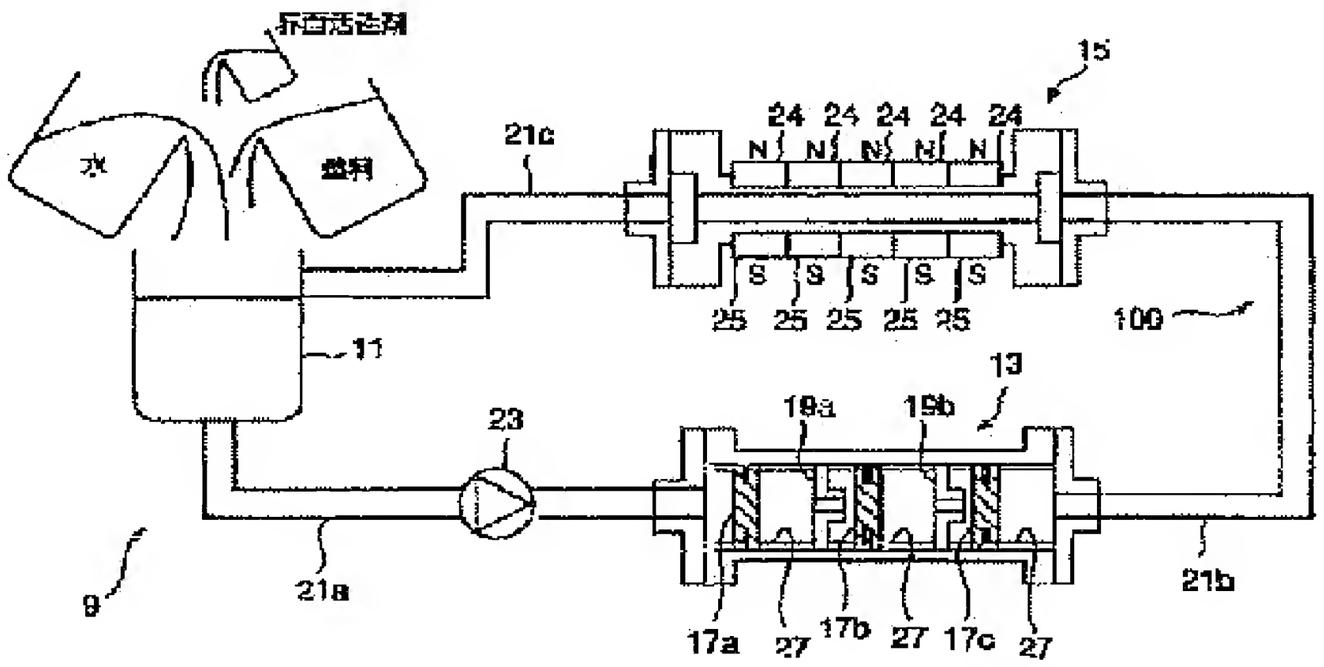


【図２】



【図６】